تم الرفع بواسطة م.معن أبو عيسى

Circuit 1 Lab midterm

ENGINEERING

CIRCUIT1 LAB

التخصص والمستوى :

اسم المساق :

تاريخ الامتحان : 1/12/2010

زمن الامتحان : 60min




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السلطة الوطنية الفلسطينية

جامعة فلسطين التقنية طولكرم "خضوري"

first exam 2010/2011

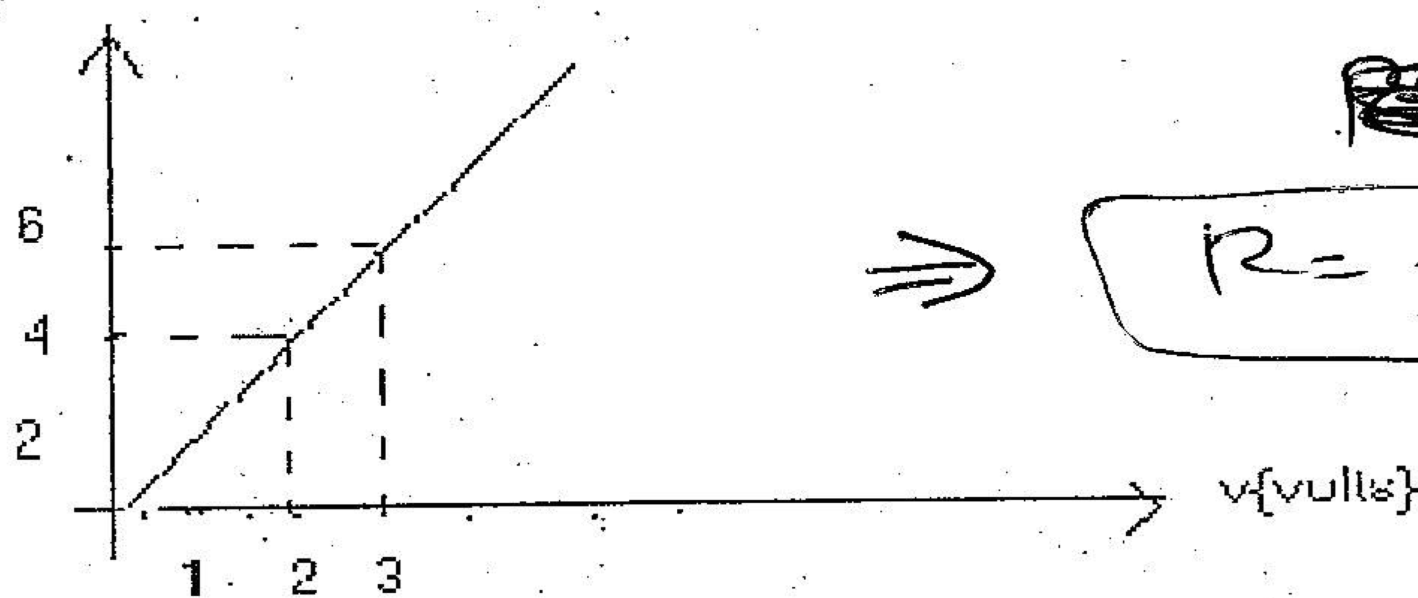
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الشعبة : اربعاء 2 - 5

الاسم : معن سلام قفدان

العلامة 11/15

**Q1**) The v-I characteristics of a linear resistor is shown below . find R



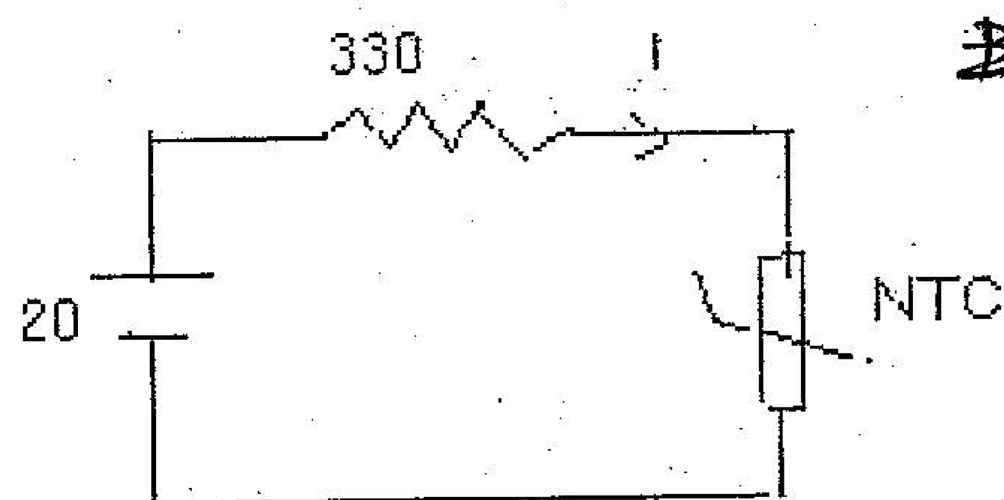

$\Rightarrow$ $R = \frac{1}{Slope}$ $\Rightarrow$ Slope $= \frac{6-4}{3-2} = \frac{2}{1} = 2$

$\therefore R = \frac{1}{2} \times 10^3 = \frac{1000}{2} = 500\ \Omega$

$\therefore R = \frac{3}{6\times10^{-3}} = \frac{1}{2}\times10^{3} = 500\ \Omega$

R= $500\ \Omega$ ✓ (1)

Q2)In the circuit shown below the NTC is connected in series with 330Ω resister .If the current flow stabilizes at 4m A .Find the value of the resistance of the NTC RNTC &the total resistance of the circuit(RTOT)




$V = I R_{eq}$

$R_{eq} = 330 + R_{NTC}$

$\therefore 20 = 4\times10^{-3}(330 + R_{NTC})$

$\Rightarrow 330 + R_{NTC} = \frac{20}{4\times10^{-3}} = 5\times10^3 = 5000\ \Omega$ $\Rightarrow$ $\therefore R_{NTC} + 330 = 5000$

$\Rightarrow R_{NTC} = 5000 - 330 = 4.67\ k\Omega$

$\Rightarrow R_{TOT} = 330 + 4670 = 5000 = 5k\Omega$

RTOT = $5k\Omega$

RNTC= $4.67\ k\Omega$ (2)

Q3)At ambient temperature of 18 c˚ the parallel circuit of PTC and R1 Loads the voltage source with a total resistance of 5KΩ.What is the value of PTC resister at this temperature

RPTC= $10\ k\Omega$ (1)

Vs, 10K, R1, PTC

$\therefore R_{eq} = 5\ k\Omega$

$\therefore R_1 \parallel R_{PTC} = 5\ k\Omega$

$\frac{R_1 R_{PTC}}{R_1 + R_{PTC}} = 5k\Omega$

$\frac{10 R_{PTC}}{10 + R_{PTC}} = 5 \Rightarrow 5(10 + R_{PTC}) = 10 R_{PTC}$

$50 + 5R_{PTC} = 10 R_{PTC} \Rightarrow$

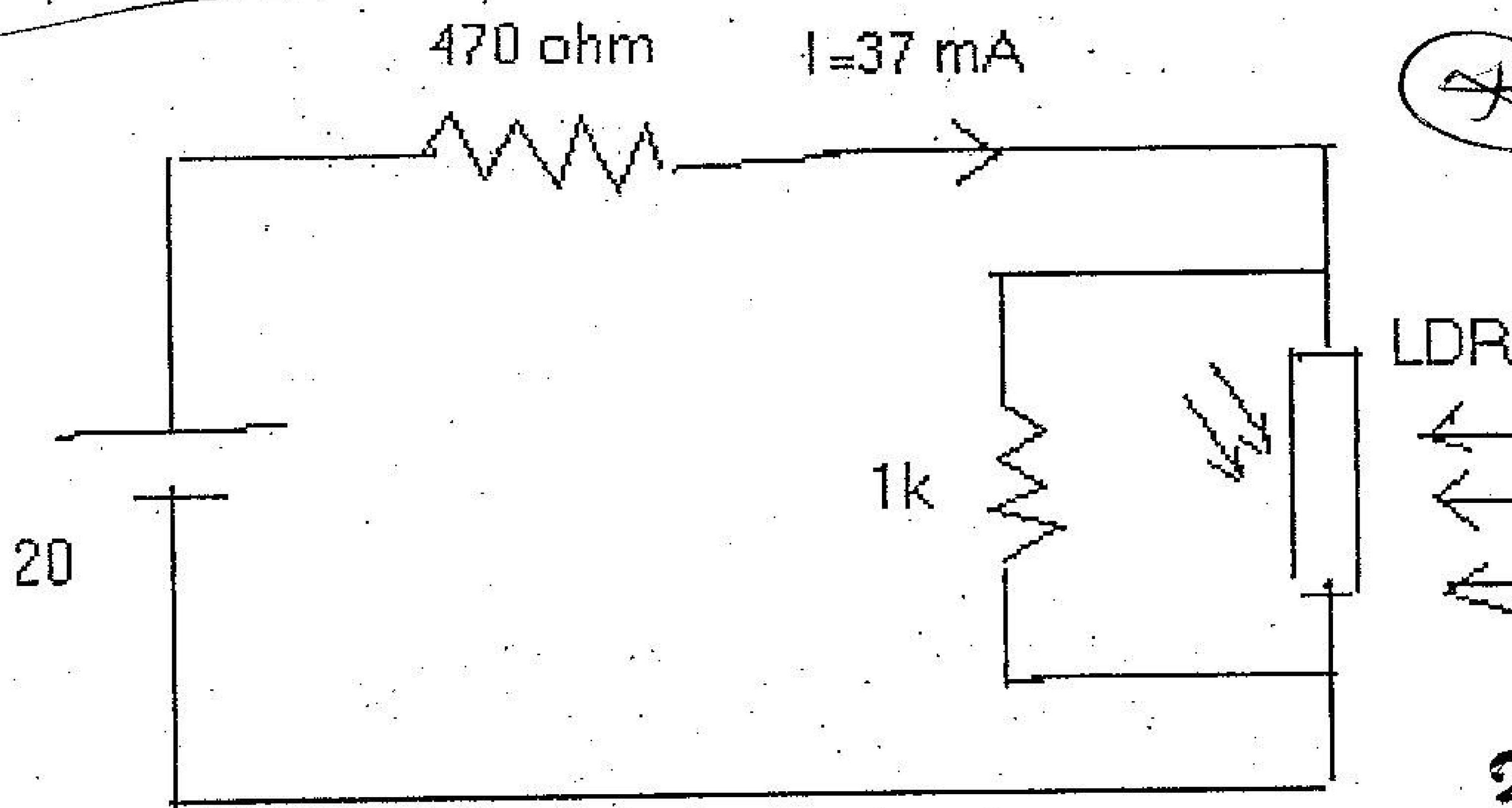
$50 = 5R_{PTC} \Rightarrow R_{PTC} = \frac{50}{5} = 10k\Omega$

Q4)In the circuit shown below the LDR is connected in parallel with 1kΩ resister .When the light beam is maximum it was found the total current in the circuit $I_{tot}$=37 m.A . In dark it was found that the LDR is open circuit Find the minimum value of the LDR resistance $R_{LDRM}$. & the maximum &minimum voltage across the LDR.

$V_{min} = V_s \frac{1}{1+1} = 20(\frac{1}{2}) = 10V$

$V_{max} = V_s(1) = 20(1) = 20V$

| | |
|---|---|
| RLDRM= | 1 kΩ |
| Vmax= | 20 V |
| Vmin= | 10 V |




$R_{eq} = 470 + (1 \parallel R_{LDR})$

$R_{eq} = 470 + \frac{R_{LDR}}{1+R_{LDR}}$

$\therefore 20 = 37\times10^{-3}\left(470 + \frac{R_{LDR}}{1+R_{LDR}}\right)$

$\frac{20\times10^{3}}{37} = 0.470 + \frac{R_{LDR}}{1+R_{LDR}}$

$\Rightarrow 540.5 = 0.470 + \frac{R_{LDR}}{1+R_{LDR}}$

$540 = \frac{R_{LDR}}{1+R_{LDR}} \Rightarrow 540(1+R_{LDR}) = R_{LDR}$

$540 + 540R_{LDR} = R_{LDR} \Rightarrow 540 = -539R_{LDR} \Rightarrow R_{LDR} = \frac{540}{-539} \approx 1k\Omega$

Q5)For the circuit shown below if the voltmeter reading is 5 Volts .Find I , I1, I2 ,V1 , V2 , V3

| | |
|---|---|
| I1= | 1.84 mA |
| I2= | 1.58 mA |
| I= | 3.5 mA |
| V1= | 3.16 V |
| V2 | 1.84 V |
| V3 | -1.8 V |

$I_3$: $2000I_3 + 6 - 2000(1.58\times10^{-3}) = 0$

$2000I_3 + 6 - 7.16 = 0$ (sic)

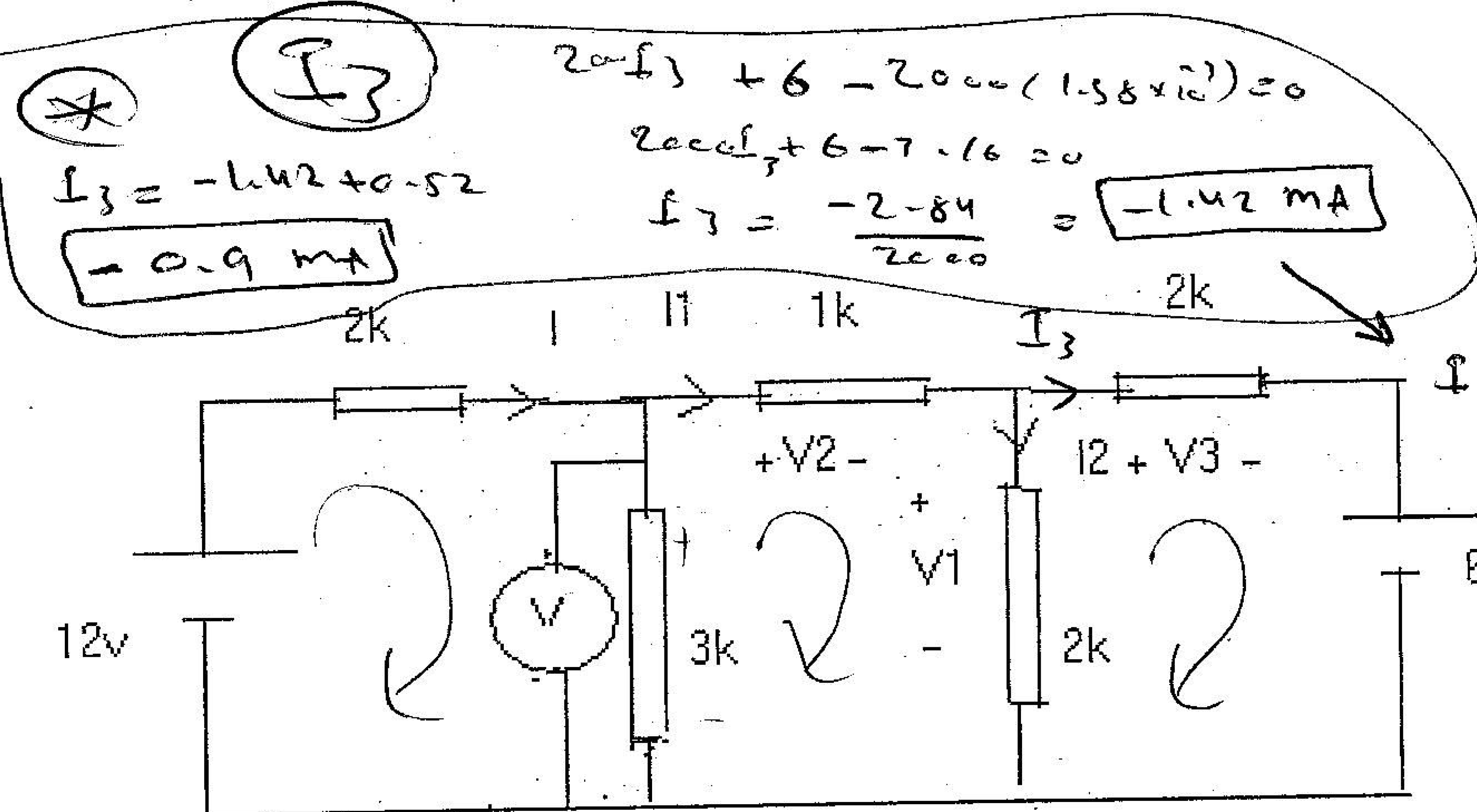
$I_3 = \frac{-2.84}{2000} = -1.42$ mA

$I_3 = -1.42 + 0.52 = -0.9$ mA

$V = 5$ Volts $\Rightarrow V = IR$

$5 = I(3000)$

$\Rightarrow I = \frac{5}{3000} = 1.66$ mA




Loop 1: $-12 + 2I + 3000(1.6\times10^{-3}) = 0$

$\Rightarrow -12 + 2000I + 5 = 0 \Rightarrow 2000I = 7$

$\Rightarrow I = \frac{7}{2000} = 3.5$ mA

$I_1 = 3.5 - 1.66 = 1.84$ mA

Loop 2: $-5 + 1000I_1 + 2000I_2 = 0$

$-5 + 1000(1.84\times10^{-3}) + 2000I_2 = 0 \Rightarrow -5 + 1.84 + 2000I_2 = 0$

$2000I = 3.16 \Rightarrow I = \frac{3.16}{2000}$

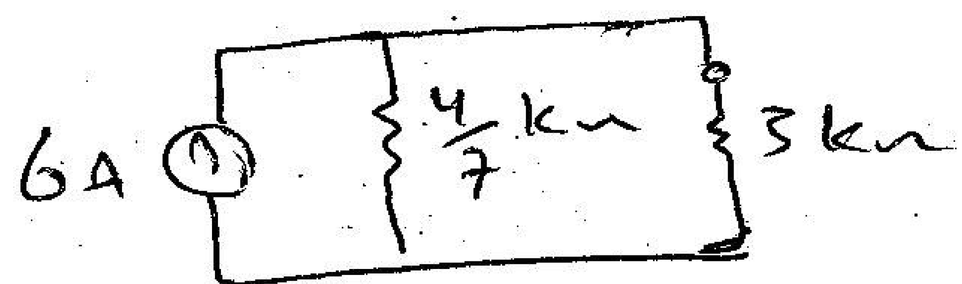
$I_2 = 1.58$ mA

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$\therefore V_1 = I_2(2000) = 1.58\times10^{-3}\times2\times10^{3} = 3.16V$

$V_2 = I_1(1000) = 1.84\times10^{-3}\times1\times10^{3} = 1.84V$

$V_3 = I_3(2000) = -0.9\times10^{-3}\times2\times10^{3} = -1.8V$



Norton Equivalent

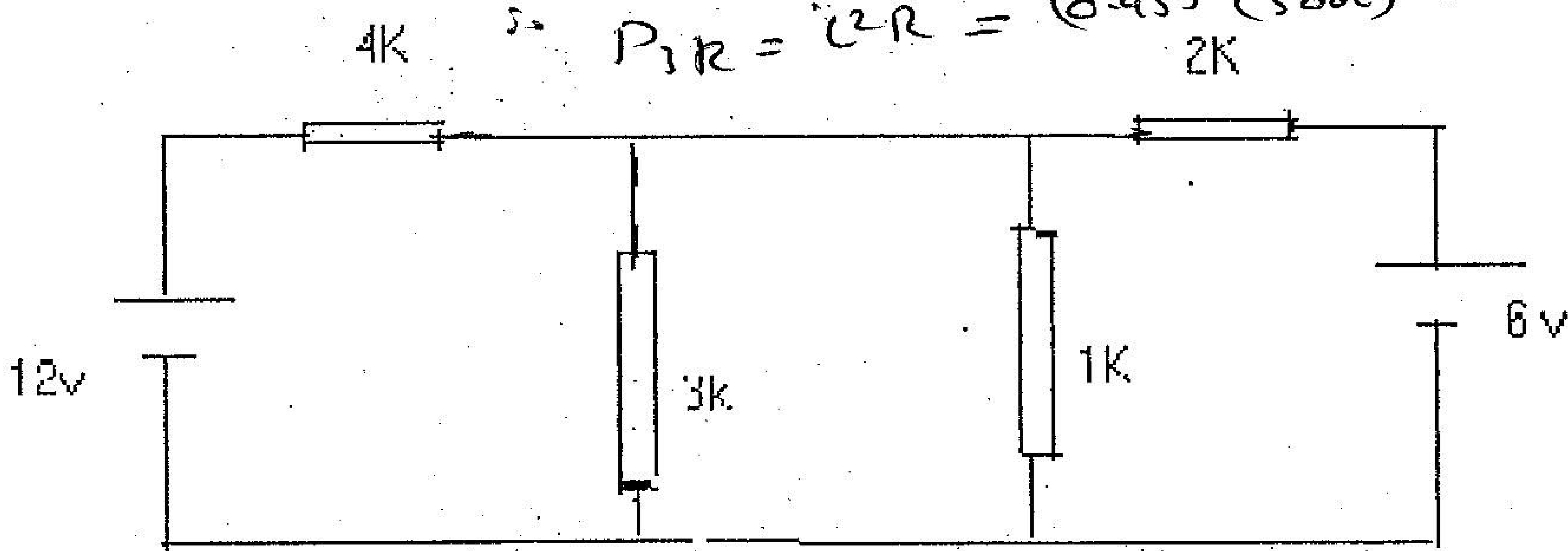
Q6)For the circuit shown below, using Norton theorem find the power of 3kΩ resister

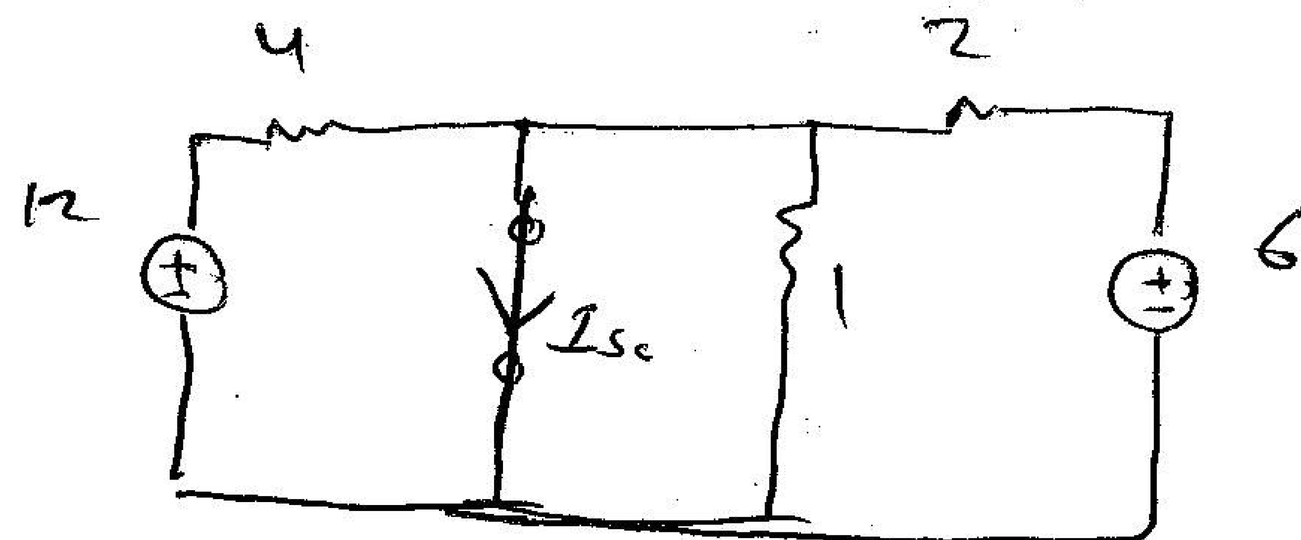
| | |
|---|---|
| IN= | 6 mA |
| Voc= | 9 V |
| RTH= | 4/7 kΩ |
| P3K= | 2.7 mW |

$P_{3k} = i^2 R$

$i_{3k} = 6\left(\frac{\frac{4}{7}}{\frac{4}{7}+3}\right) = 0.95\ mA$

$\therefore P_{3k} = i^2 R = (0.95)^2 (3000) = 0.9\times10^{-6} \times 3\times10^{3} = 2.7\times10^{-3} = 2.7\ mW$




using super position ⇒ from 12 V ⇒ $I_{sc1} = \frac{12}{4} = 3\ mA$

from 6 V ⇒ $I_{sc2} = \frac{6}{2} = 3\ mA$

$\therefore I_{sc} = 3+3 = 6\ mA = I_N$

$R_N$ ⇒ $(1 \| 2) \| (4)$ ⇒ $1 \| 2 = \frac{1\times2}{1+2} = \frac{2}{3}$

$\frac{2}{3} \| 4 = \frac{\frac{2}{3}\times4}{\frac{2}{3}+4} = \frac{\frac{8}{3}}{\frac{14}{3}} = \frac{4}{7}\ k$

$V_{oc1}$ (from 12 V) = 12 V | $V_{oc2}$ (from 6 V) $= 6\left(\frac{1}{1+2}\right) = 3\ V$

⇒ $V_{oc} = 12 - 3 = 9\ V$

Q7)Use superposition to find I in the circuit below

| | |
|---|---|
| I'= | -12 mA |
| I''= | 9 mA |
| I= | -3 mA |

I' from 12 V Source

I'' from 6 V Source

$I' = \frac{12}{1\times10^{3}} = 12\ mA$ → -12 mA

عكس اتجاه 12 V

$I'' = \frac{6}{(2 \| 1)} = \frac{6}{\frac{2}{3}} = \frac{18}{2} = 9\ mA$

$\therefore I' + I'' = -12 + 9 = -3\ mA$

